



State of the Science of Endocrine Disrupting Chemicals - 2012

Edited by

Åke Bergman, Jerrold J. Heindel, Susan Jobling,
Karen A. Kidd and R. Thomas Zoeller

State of the Science of Endocrine Disrupting Chemicals - 2012

An assessment of the state of the science of endocrine disruptors prepared by a group of experts
for the United Nations Environment Programme and World Health Organization.

Edited by
Åke Bergman, Jerrold J. Heindel, Susan Jobling,
Karen A. Kidd and R. Thomas Zoeller



1972-2012:
Serving People
and the Planet

This publication was developed in the IOMC context. The contents do not necessarily reflect the views or stated policies of individual IOMC Participating Organizations.

The Inter-Organisation Programme for the Sound Management of Chemicals (IOMC) was established in 1995 following recommendations made by the 1992 UN Conference on Environment and Development to strengthen co-operation and increase international co-ordination in the field of chemical safety. The Participating Organisations are FAO, ILO, UNDP, UNEP, UNIDO, UNITAR, WHO, World Bank and OECD. The purpose of the IOMC is to promote co-ordination of the policies and activities pursued by the Participating Organisations, jointly or separately, to achieve the sound management of chemicals in relation to human health and the environment.

WHO Library Cataloguing-in-Publication Data

State of the science of endocrine disrupting chemicals 2012 / edited by Åke Bergman, Jerrold J. Heindel, Susan Jobling, Karen A. Kidd and R. Thomas Zoeller.

1.Endocrine disruptors. 2.Environmental exposure. 3.Animals, Wild. 4.Endocrine system. 5.Hormone Antagonists I.Bergman, Åke. II.Heindel, Jerrold J. III.Jobling, Susan. IV.Kidd, Karen. V.Zoeller, R. Thomas. VI.World Health Organization. VII.United Nations Environment Programme. VIII.Inter-Organization Programme for the Sound Management of Chemicals.

© United Nations Environment Programme and the World Health Organization, 2013

ISBN: 978-92-807-3274-0 (UNEP) and 978 92 4 150503 1 (WHO) (NLM classification: WK 102)

All rights reserved.

This publication can be obtained from the United Nations Environment Programme (UNEP) (e-mail: unep.tie@unep.org) or from WHO Press, World Health Organization, 20 Avenue Appia, 1211 Geneva 27, Switzerland (tel.: +41 22 791 3264; fax: +41 22 791 4857; e-mail: bookorders@who.int). Requests for permission to reproduce or translate this publication – whether for sale or for noncommercial distribution – should be addressed to UNEP (e-mail: unep.tie@unep.org) or to WHO Press, at the above address (fax: +41 22 791 4806; e-mail: permissions@who.int).

The designations employed and the presentation of the material in this publication do not imply the expression of any opinion whatsoever on the part of UNEP or WHO concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Dotted lines on maps represent approximate border lines for which there may not yet be full agreement. The mention of specific companies or of certain manufacturers' products does not imply that they are endorsed or recommended by UNEP or WHO in preference to others of a similar nature that are not mentioned. Errors and omissions excepted, the names of proprietary products are distinguished by initial capital letters. All reasonable precautions have been taken by UNEP or WHO to verify the information contained in this publication. However, the published material is being distributed without warranty of any kind, either expressed or implied. The responsibility for the interpretation and use of the material lies with the reader. In no event shall UNEP or WHO be liable for damages arising from its use.

This document is not a formal publication of the United Nations Environment Programme and the World Health Organization and the views expressed therein are the collective views of the international experts participating in the working group and are not necessarily the views of the organizations.

UNEP promotes environmentally sound practices globally and in its own activities. This publication is printed on 100% recycled paper, using vegetable - based inks and other eco-friendly practices. Our distribution policy aims to reduce UNEP's carbon footprint.

Preface

The *State of the Science of Endocrine Disrupting Chemicals—2012*, is an update of the scientific knowledge, including main conclusions and key concerns, on endocrine disruptors as part of the ongoing collaboration between the World Health Organization (WHO) and the United Nations Environment Programme (UNEP) to address concerns about the potential adverse health effects of chemicals on humans and wildlife.

We live in a world in which man-made chemicals have become a part of everyday life. It is clear that some of these chemical pollutants can affect the endocrine (hormonal) system, and certain of these endocrine disruptors may also interfere with the developmental processes of humans and wildlife species. Following international recommendations in 1997 by the Intergovernmental Forum on Chemical Safety and the Environment Leaders of the Eight regarding the issue of endocrine disrupting chemicals (EDCs), WHO, through the International Programme on Chemical Safety (IPCS), a joint programme of WHO, UNEP and the International Labour Organization, developed in 2002 a report entitled *Global Assessment of the State-of-the-Science of Endocrine Disruptors*.

The Strategic Approach to International Chemicals Management (SAICM) was established by the International Conference on Chemicals Management (ICCM) in February 2006, with the overall objective to achieve the sound management of chemicals throughout their life cycle so that, by 2020, chemicals are used and produced in ways that minimize significant adverse effects on human health and the environment.

SAICM recognizes that risk reduction measures need to be improved to prevent the adverse effects of chemicals on the health of children, pregnant women, fertile populations, the elderly, the poor, workers and other vulnerable groups and susceptible environments. It states that one measure to safeguard the health of women and children is the minimization of chemical exposures before conception and through gestation, infancy, childhood and adolescence.

SAICM also specifies that groups of chemicals that might be prioritized for assessment and related studies, such as for the development and use of safe and effective alternatives, include chemicals that adversely affect, inter alia, the reproductive, endocrine, immune or nervous systems. A resolution to include EDCs as an emerging issue under SAICM was adopted in September 2012 by ICCM at its third session.

EDCs represent a challenge, as their effects depend on both the level and timing of exposure, being especially critical when exposure occurs during development. They have diverse applications, such as pesticides, flame retardants in different products, plastic additives and cosmetics, which may result in residues or contaminants in food and other products. Therefore, EDCs may be released from the products that contain them.

The protection of the most vulnerable populations from environmental threats is a key component of the Millennium Development Goals. As the challenge in meeting the existing goals increases, with work under way in developing countries to overcome traditional environmental threats while dealing with poverty, malnutrition and infectious disease, emerging issues should be prevented from becoming future traditional environmental threats. Endocrine disruption is a challenge that must continue to be addressed in ways that take into account advances in our knowledge.

UNEP and WHO, in collaboration with a working group of international experts, are taking a step forward by developing these documents on endocrine disruptors, including scientific information on their impacts on human and wildlife health and key concerns for decision-makers and others concerned. The well-being of future human and wildlife generations depends on safe environments.

UNEP and WHO convened, in December 2009, a meeting of the planning group for the development of an update to the 2002 IPCS “Global Assessment of the State-of-the-Science of Endocrine Disruptors”. This was followed by teleconferences and a planning meeting

in Geneva in June 2010. These meetings allowed for defining the scope, the outline, the development process and suggestions of main authors that would be integrated in the working group. Authors were identified because of previous peer-reviewed publications and according to their area of expertise. The following experts provided guidance and expertise for the planning stages:

- Åke Bergman, Stockholm University, Sweden
- Poul Bjerregaard, University of Southern Denmark, Denmark
- Niels Erik Skakkebaek, University of Copenhagen, Denmark
- Hans-Christian Stolzenberg, Federal Environment Agency, Germany
- Jorma Toppari, University of Turku, Finland

The working group consequently met in Stockholm in November 2010, in Copenhagen in May 2011 and in Geneva in December 2011, as well as through teleconferences, to develop and revise various drafts of the documents. Professor Åke Bergman led the working group and facilitated the development of the chapters with the main authors in coordination with UNEP and WHO.

The following international scientific experts were part of the working group that developed the documents:

- Georg Becher, Norwegian Institute of Public Health, Norway
- Åke Bergman, Stockholm University, Sweden (Leader)
- Poul Bjerregaard, University of Southern Denmark, Denmark
- Riana Bornman, Pretoria Academic Hospital, South Africa
- Ingvar Brandt, Uppsala University, Sweden
- Jerrold J. Heindel, National Institute of Environmental Health Sciences, USA
- Taisen Iguchi, National Institutes of Natural Sciences, Okazaki, Japan
- Susan Jobling, Brunel University, England
- Karen A. Kidd, University of New Brunswick, Canada
- Andreas Kortenkamp, University of London and Brunel University, England
- Derek C.G. Muir, Environment Canada, Canada
- Roseline Ochieng, Aga Khan University Hospital, Kenya
- Niels Erik Skakkebaek, University of Copenhagen, Denmark

- Jorma Toppari, University of Turku, Finland
- Tracey J. Woodruff, University of California at San Francisco, USA
- R. Thomas Zoeller, University of Massachusetts, USA

The development of these documents would not have been made possible without the significant contributions of the planning and working groups and the valuable leadership of Professor Åke Bergman, as well as of the lead authors of the main chapters Professor Susan Jobling, Dr. Jerrold J. Heindel, Professor Karen A. Kidd and Professor R. Thomas Zoeller. UNEP and WHO are very grateful for their extensive support and for the hard work of all.

Additional authors that contributed specific sections to the main document were:

- Bruce Blumberg, University of California, Irvine, USA
- Jayne V. Brian, Brunel University, United Kingdom
- Stephanie C. Casey, University of California, Irvine, USA
- Heloise Frouin, Institute of Ocean Sciences, Fisheries and Oceans, Canada
- Linda C. Giudice, *University of California, San Francisco, USA*
- Monica Lind, Uppsala University, Sweden
- Erik Ropstad, Norwegian School of Veterinary Science, Oslo, Norway
- Peter S. Ross, Institute of Ocean Sciences, Fisheries and Oceans Canada
- Laura N. Vandenberg, Tufts University, Medford, USA

A semi-final draft of the main document was reviewed in parts by the following experts:

- Scott M. Belcher, University of Cincinnati, USA
- Antonia Calafat, National Center for Environmental Health, Centers for Disease Control and Prevention, USA
- Jean-Pierre Cravedi, French National Institute for Agricultural Research (INRA), France
- Sally Darney, Research Triangle Park, USA
- Evanthia Diamanti-Kandarakis, Laiko General Hospital, Athens University, Greece
- Cynthia A. de Wit, Stockholm University, Sweden
- Tamara Galloway, College of Life and Environmental Sciences, University of Exeter, United Kingdom
- Andreas Gies, Federal Environment Agency, Germany
- Philippe Grandjean, Landmark Center, USA

- Helmut Greim, Institute of Toxicology and Environmental Hygiene, Technical University of Munich, Germany
- Louis J. Guillette, Jr., Medical University of South Carolina, USA
- Leif Kronberg, Åbo Akademi University, Finland
- Robert Letcher, Environment Canada, Canada
- Angel Nadal, Institute of Bioengineering and CIBERDEM, Miguel Hernandez University, Spain
- Roger Beemer Newman, Medical University of South Carolina, USA
- Heather Patisaul, North Carolina State University, USA
- Gail S. Prins, University of Illinois at Chicago, USA
- Martin Scheringer, Institute for Chemical and Bioengineering, The Swiss Federal Institute of Technology (ETH), Switzerland
- Helmut Segner, University of Bern, Switzerland
- Nicolás Olea Serrano, Facultad de Medicina, Spain
- Peter Sly, University of Queensland, Australia
- Shirlee Tan, Independent Consultant, Paris, France
- Manuel Tena-Sempere, University of Córdoba, Spain

The UNEP/WHO Secretariat for this project included:

- Marie-Noel Bruné Drisse, Department of Public Health and Environment, World Health Organization, Geneva, Switzerland
- Carlos Dora, Department of Public Health and Environment, World Health Organization, Geneva, Switzerland
- Ruth A. Etzel, Department of Public Health and Environment, World Health Organization, Geneva, Switzerland
- Agneta Sundén Byléhn, Division of Technology, Industry and Economics, Chemicals Branch, United Nations Environment Programme, Geneva, Switzerland

- Simona Surdu, Department of Public Health and Environment, World Health Organization, Geneva, Switzerland

Editorial assistance was provided by Susan Jobling, and reference processing was performed by Ioannis Athanassiadis, Åke Bergman and Hans von Stedingk. Further editorial assistance was provided by Kathy Prout (WHO) and Marla Sheffer. John Bellamy assisted with the design of drawings and figures and the layout of the two documents. Nida Besbelli, consultant to the UNEP Secretariat, provided organizational support and assisted with the finalization of references, tables, and lists of abbreviations and species. A list of chemicals, including abbreviations/common names and Chemical Abstracts Service registry numbers, was provided by Derek C.G. Muir and Åke Bergman. A list of species discussed in the summary and main documents was prepared by Nida Besbelli, Åke Bergman, Poul Bjerregaard and Susan Jobling. Further contributions and reviews were received from Heli Bathija (WHO), Timothy J. Kasten (UNEP), Desiree Montecillo Narvaez (UNEP), Maria Neira (WHO) and Sheryl Vanderpoel (WHO).

The working group members, scientific experts and contributors of text served as individual scientists and not as representatives of any organization, government or industry. All individuals who participated in the preparation of these documents served in their personal capacity and were required to sign a Declaration of Interest statement informing the Responsible Officer if, at any time, there was a conflict of interest perceived in their work. Such a procedure was followed, and no conflicts of interest were identified.

The development and publication of the two documents were supported by funds provided to UNEP by the Norwegian government, the Swedish Environment Ministry, the Swedish Research Council (FORMAS) and the Swedish Environmental Protection Agency. Further support was provided to WHO by the United States National Institute of Environmental Health Sciences (NIEHS) through cooperative agreement 1 U01 ES02617. The contents of the documents are solely the responsibility of the contributors and do not necessarily represent the official views of the NIEHS.

预览已结束，完整报告链接和二维码如下：

https://www.yunbaogao.cn/report/index/report?reportId=5_28459

